Computers & Education 84 (2015) 62–77

Contents lists available at ScienceDirect

Computers & Education

journal homepage: www.elsevier.com/locate/compedu

What's the difference? Learning collaboratively using iPads in conventional classrooms

Garry Falloon*

The Faculty of Education, University of Waikato, Hillcrest Rd, Hamilton, New Zealand

ARTICLE INFO

Article history:
Received 21 November 2014
Received in revised form
23 January 2015
Accepted 26 January 2015
Available online 7 February 2015

Keywords:
iPad
Collaboration
Google Docs
Learner
BYOD

ABSTRACT

Since its release in 2010, Apple's iPad has attracted much attention as an affordable and flexible learning tool for all levels of education. A number of trials have been undertaken exploring the device's efficacy for specific purposes, such as improving delivery of course content and learning resources at tertiary level, and the performance of apps for meeting specialised learning needs. However, with increased mainstreaming of these devices through iPad-supported modern learning environment (MLE) and Bring Your Own Device (BYOD) programmes, data are becoming available that provides insight into how these devices function as part of regular classroom environments. This article reports an analysis of data collected over almost 3 years from nearly 100 New Zealand primary (elementary) students of different ages, who used iPads daily for most curriculum tasks. Specifically, it uses different data sources to explore how observed and recorded device design and app attributes, affected the students' ability to work collaboratively.

Results suggest fundamental differences exist between iPads and other digital devices that helped these students collaborate, and that when combined with cloud-based apps and services such as Google Docs, extended this collaboration to much wider audiences well beyond the school gate. It concludes that beyond the hype and rhetoric, exciting potential exists for this tool to support a 'blurring in the line' between learning in formal school and informal environments.

1. Introduction

This article reports an analysis of data collected between 2012 and 14 from nearly 100 New Zealand primary (elementary) school students of different ages, who used iPads in a range of collaborative learning scenarios. It combines analysis of display recordings from all students with survey and focus group data collected from groups of 7–10 year olds, to learn more about how features of iPads and apps affected their ability to work collaboratively. The study was prompted following analysis of display-recorded data for other purposes (see below), which revealed consistent patterns of design-related device and app use across the groups that appeared to support their collaborative endeavours. However, further investigation was needed to determine if initial observations were correct, and if so, how relevant students viewed the device and app features for supporting their collaboration. Such an analysis is timely given the rapid adoption of these devices in classrooms as individual and collaborative learning tools, and the level of hype and rhetoric surrounding their so-called transformative potential. The study examines if any differences exist between the iPad and other digital devices that may make it a 'stand out performer' for supporting learner collaboration.

2. Learner collaboration and handheld technologies

Studies spanning many years have pointed to the potential of digital technologies for supporting collaboration between learners and teachers, both in distance education and conventional classroom contexts (e.g., Brandon & Hollingshead, 1999; Cronjé, 1997; Haythornthwaite, 1999; Hooper, 1992; Kreijns, Kirschner, & Jochems, 2002; Neale, Carroll, & Rosson, 2004; Roschelle & Pea, 2002; Stanton,

* Tel.: +64 7 838 4466x6553.
E-mail address: falloong@waikato.ac.nz.

http://dx.doi.org/10.1016/j.compedu.2015.01.010
0360-1315/

Neale, & Bayon, 2002). More recently, research attention has turned towards mobile and touch screen technologies as offering new possibilities for supporting school learner collaboration, due to their "mobility, flexibility and instant access … which allows students to engage in highly collaborative activities anywhere, at any time" (Zurita & Nussbaum, 2004, p.293). The first of these studies used handheld devices such as wireless-enabled PDAs (personal digital assistants), generally in planned investigations into learner collaboration in subjects such as mathematics and language. In their Chilean research, Zurita and Nussbaum (2004) structured two interventions supported by purpose-built PDA software. The trial involved a total of 48 six and seven year old students working together to solve puzzle-like challenges, one focussing on word building from syllables in Spanish, and the other on collaborating as a team to numerically match sets of objects. Their analysis drew on the early work of Hollan and Stornetta (1992), Gutwin, Roseman, and Greenberg (1996) and Kreijns et al. (2002) in evaluating the extent to which the devices supported learner collaboration in areas research identified as challenging. These were:

1 Coordination (device helps coordinate task activities)
2 Communication (device facilitates communication between team members)
3 Material organisation (device facilitates access to and organisation of task resources)
4 Negotiation (device supports negotiation between team members)
5 Interactivity (device facilitates input into decision making by all team members)
6 Mobility (device allows individual task input and movement with device to other team members at different locations).

Their results indicated using handhelds running appropriately designed software can help students collaborate more effectively on tasks by structuring access to materials, providing a device-imposed system for interaction, negotiation, coordination and communication, and providing flexibility and portability that allowed students to access support anywhere, at any time. They specifically commented on the importance of having access to robust wireless networking that "open(ed) a new world of (collaborative) possibilities" (p.312), while at the same time alluding to the importance of task design, and how this is reflected in the content and interface of the software used.

Zurita and Nussbaum's findings echo those of an earlier study by Danesh, Inkpen, Lau, Shu and Booth (2001) who developed a Palm 3 (PDA) application called *Geney*, and trialled it with small groups of 10–13 year old students. *Geney* was a game designed to help students understand basic genetic concepts such as dominant and regressive, through problem solving activities requiring intra and inter-pair collaboration. Similar to Zurita and Nussbaum's study, Danesh et al. concluded using handhelds can support student collaboration if the learning task, as reflected through appropriate software design, provided sufficient reason, structure and engagement/motivation to do so. However, their study highlighted device limitations such as the unreliability of Bluetooth-based networking, small screen size, and the limited operating memory and data storage capacity of PDAs. These factors restricted the extent to which more than one student at a time could meaningfully contribute to the task, and also influenced the task itself by placing significant technical design constraints on the software.

Recent developments in mobile technology have spawned a new array of digital, touch screen learning tools, such as Apple's iPad and Samsung's Galaxy range. The advent of these relatively affordable, portable and networkable devices with vastly superior specifications to their PDA predecessors and wide array of app choices, has meant many schools now see them as a viable option for equipping their students with a learning resource compatible with the demands of so-called '21st Century Learning'. Indeed, an increasing number of schools are mandating their inclusion through Bring Your Own Device (BYOD) or mobile-supported programmes, often requiring parents to provide digital tablets in much the same way as exercise and text books are included in stationery lists (Ihaka, 2013). This has led to many more devices being available in classrooms, and their 'mainstreaming' as a regular learning resource. The advancement has also offered potential to move away from the research methodologies of the earlier 'one-off' trials, towards exploring if and how this new generation of device with its greater ubiquity and enhanced capability, is able to support learner collaboration *integral* to everyday classroom activity. While a few studies have touched on this in relation to device affordances, methodologically these have still been based on formal trials linked to one-off tasks or specific apps, or learners with particular needs, rather than being completely embedded in routine classroom environments and work (e.g., Brand & Kinash, 2010; Culén & Gasparini, 2011; Desai, Chow, Mumford, Hotze, & Chau, 2014; Garcia, 2011; Kucirkova, Messer, Sheehy, & Panadero, 2014; Lin & Nzai, 2014; Mozaffar, 2012).

One of the few available studies that has attempted to address this research gap was undertaken by Fisher, Lucas, and Galstyan (2013). Their research aimed to learn more about "how students interact with one another while using technological devices (iPads) in traditional, face-to-face learning environments" (p.167). It analysed how university students provided with a set of iPads for a semester-long Business Calculus course, used them in a range of group activities designed to develop core course concepts. Their use was compared with other students using laptops for the same tasks. Observational, focus group and survey data were coded under categories relating to physical location of use (public vs private), type of use in space (public vs personal), activity, extent of verbal interaction, and relative dominance of group members. Their results revealed significantly higher levels of device-supported collaboration in public workspaces for the iPad groups, and greater use of iPads for sharing and collaborating *during* work activity, rather than only at its conclusion. Students attributed this to design affordances such as the iPad's ability to be passed around, the lack of an obstructive, barrier-forming screen, and a display supporting multiple, and if desired, simultaneous interactions. According to Fisher et al., these affordances offered significant advantages over laptops, by allowing students to more easily transition between private and public spaces and uses, according to task demands. While Fisher et al.'s study signals particular design features of iPads supporting learner collaboration, it was still a relatively limited trial located within a single subject discipline in a university. The study detailed in this article is profoundly different, and significantly extends earlier research. It is based on data collected over a period of almost 3 years in three different primary (elementary) school classrooms, where class and group sets of iPads were present 'fulltime', and used for the complete array of curriculum learning activities.

3. Research questions

Data collection was informed by these questions:

1. What design and technical features of iPads and apps *appear* to support work collaboration in three primary classrooms?
2. How do students perceive these features as supporting, or not, work collaboration?